Prof. Castle has been recognised as one of the most active workers on these lines. A book embodying his outlook after years of teaching and research is sure of a welcome from all who are interested in these matters. The volume is evidently designed more especially for the university student. It falls roughly into three sections: an introductory portion dealing with theories of evolution and what may be termed pre-Mendelian genetics, a main part treating of contemporary genetic work, and a final section on human heredity and eugenics. The amount of ground covered involves a condensed treatment of many important questions, and though this need not be a drawback to the student whose reading is supplemented by lectures, it makes it rather a difficult book for the average reader.

The author has approached the subject almost entirely from the zoological side, and, for a book of the sort, devotes an unusual amount of space to the inheritance of characters in domesticated animals. This part of the work is freely illustrated by photographs which have generally been well reproduced. But in some cases, as in Fig. 53, an attempt has been made to indicate colour differences in black and white, and the result is not happy.

Though the space devoted to plants is avowedly brief, the omission of any adequate account of the remarkable phenomena exhibited by plant chimæras must be regarded as a shortcoming, for it may well be that the principles here involved will turn out eventually to be of much wider application than appears at present. Some of the statements in this section are open to criticism by the botanist, as, for example, that which records doubling in the poppy as recessive to single. The reverse is true of Meconopsis.

In connection with sex-determination more attention might have been paid to the phenomena associated with gynandromorphs. The extraordinarily interesting and suggestive work of Goldschmidt is not even mentioned.

The best part of the book is that dealing with the effect of selection and the constancy of hereditary factors. From extensive experiments on the inheritance of white markings in rats, Prof. Castle has come to the conclusion that the hereditary factors upon which pattern depends may undergo alteration on crossing, thereby becoming either more or less potent in bringing about their peculiar reaction. *Plus* and *minus* variants are thus produced which may be isolated by selection. He speaks of the process as one of "contamination," though it is not altogether clear how he supposes it to be brought about. His ideas have been subjected to severe criticism in America, where many geneticists prefer to explain these phenomena on the hypothesis of multiple factors or of specific modifiers. It is clear that we do not yet understand this type of inheritance, and Prof. Castle's presentation of his case deserves most careful consideration.

The treatment of eugenics is eminently sane, and most people will probably agree with the conclusion that "we should extend our knowledge as rapidly as possible, but not legislate until we are very sure of our ground."

An excellent feature is an appendix containing a translation of Mendel's paper, which ought to be carefully digested by every student. A fairly full bibliography concludes the work. This might well be revised in a later edition to include all references to papers mentioned in the text. On p. 208 alone, for example, there are three such references which are not to be found in the bibliography.

OUR BOOKSHELF.

Life and Habit. By Samuel Butler. New edition, with author's addenda. Pp. x + 310. (London: A. C. Fifield, 1917.) Price 5*s*. net.

We were a little afraid to read "Life and Habit" again after a quarter of a century, lest all the magic might have gone. Perhaps some of it has, for we found tediousness in the criticisms of Darwin—*e.g.* in that culminating on p. 260 with the conclusion that a certain sentence from the "Origin of Species" "does not contain, or at any rate convey, any clear or definite idea at all." Butler was sometimes too much preoccupied with his own views; in this case the meaning of Darwin's sentence seems no conundrum. But the old charm is still in the book—the good humour, the epigrams, the dividing sword, the sincerity, the insight. The new edition seems to differ from that of 1877 only in including four short addenda found among the author's papers. The first and second are biologically interesting; the fourth strikes one as a lapse of good taste which should have been left to blush unseen.

That Butler's genius gave him insight into evolution problems has been generally, though tardily, recognised. What were the convictions that led him to react so violently from Darwinism? The first was that "there is in every impregnate ovum a *bonâ-fide* memory," more than a system of characteristic chemical processes occurring in a characteristic colloidal substratum. By memory he did not mean necessarily conscious memory. The second was that he could not bring himself to believe that the raw materials of evolution, variations to wit, arose by chance, "blind" and "unintelligent." The third was that when a living creature does something often, the frequently repeated experience must affect the germ-cells and have results enregistered in them. It is strange that so ingenious a mind never really understood the subtlety of natural selection, the way in which it sifts directively, not randomly, its consistent reference to the established web of life, and its progressive character. J. A. T.

Compressed Air Practice in Mining. By David Penman. Pp. vii + 221. (London: Charles Griffin and Co., Ltd., 1916.) Price 5*s*. net.

The first two chapters of this book, dealing with the theory of air compression and subsequent ex-

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pansion, together with the efficiencies of each conversion of energy, are very good, as is also the short third chapter on indicator diagrams. In the fourth chapter, on air-compressors, exception may perhaps be taken that reciprocating air-compressors have been described under the names of firms which make them, rather than under headings derived from differences of design, though, otherwise, the description of these compressors is good, as is also that of the turbo-compressors in chap. v. In the sixth chapter, devoted to the transmission of compressed air, there is but little discussion of the principles of loss of pressure by friction, the author in this matter relying on Peele's well-known book. Coming, in the eighth chapter, to the machines making use of compressed air, coal-cutting machines first receive attention, and the principal machines employed in Great Britain are described. The description of rock-drills in chap. x. is accomplished chiefly under the names of firms making these drills, which is not an interesting procedure from a technical point of view. Mention is made of the use of compressed air in haulage and conveying, while in the twelfth and final chapter the transmission of power by compressed air is compared with that by electricity. In this it is stated that the cost of generating compressed air compares favourably with that of generating electricity, a statement with which few will agree.

The book in its later parts is disappointing and does not bear out the promise of its early chapters, so that, altogether, it does not do justice to its title. Within these limitations, it is, however, clearly written, while the assistance in elucidation which a number of worked problems give is a commendable feature.

Bill's School and Mine. A Collection of Essays on Education. By W. S. Franklin. Second edition. Pp. 102. (South Bethlehem, Pennsylvania: Franklin, MacNutt, and Charles, 1917.) Price 1 dollar.

THE new edition of Prof. Franklin's brightly written essays, with their advocacy of education in the "Land of Out-of-Doors" and of the claims of sensible science to a prominent place in school curricula, is enriched by a new essay on "Education after the War." In this paper he deals effectively with the unfriendliness towards science teaching prevalent in certain influential circles. Science, he urges, is finding out and learning how, whereas most people think of it only in terms of its material results. To quote Prof. Franklin: "It is now as much a mistake to oppose the fullest and widest possible development of Finding Out and Learning How as it was years ago to oppose labour-saving machinery; only it is quite necessary to make readjustments for the conservation of character and morals—and physique! Indeed, this necessity has shown itself most distinctly in our reluctance to make just such readjustments among those whose labour has been so wonderfully 'saved' by machinery!"

LETTERS TO THE EDITOR.

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Flat-foot in Young Women.

THIS deformity is exceedingly common among the young women of our nation, and it is not for lack of opportunity that it is studied so little. The present fashion of short skirts presents to us now an exceptional chance of finding out the extent of this evil. If the short skirt be destined to be permanent, it will be unique among the numerous fashions of women. The chance is here and now, and may not return.

Among certain negro races flat-foot appears to be normal, and in them perhaps it is an adaptation and a feature of their evolution. It is not so among us, and cannot be classed among the variations which are studied by biometricians.

Impressed by the sight of so many flat feet which young women are exhibiting below their short skirts, I made an observation of 355 persons of about the age of fifteen to forty-five, and noted the proportion of flat feet to normal ankles and feet, and I found 251 with definite signs of this defect. This represents a serious disability in this group for active life in the strenuous days to come, all the more because the persons noted belonged to the more favoured classes, living in a large and prosperous town. In addition to these, I noted about 200 more cases, which can only be classed as "borderland cases," and further investigation convinces me that there are more than 70 per cent. of our younger women and girls thus hindered from full locomotive and mental activity.

There are two main reasons why this deformity is important—first, that it is ugly and produces an ungainly gait; secondly, that walking and standing are rendered painful by it, and therefore unduly exhausting to the nervous system. I venture to say that if the attention of Mr. Fisher and the Board of Education were directed to Prof. Keith's valuable booklet, "The Human Body," they would not be long in doubt that flat-foot in girls is a pressing matter for them to consider, while they can. Prof. Keith points out that in all joints, except the knee-joint, the bones are kept in apposition by muscles and not by ligaments, that the arch of the foot is maintained by the steady and continuous reflex action of muscles, that the act of standing is an extremely complex act involving many muscles, and that all the time messages are passing from these to the centres in the spinal cord, from which other messages are being issued to co-ordinate the muscles in their action—a state of things well calculated to add much to the exhaustion of nervous centres when carried on with broken-down arches of the feet.

The series of cases I have described here is too small for any generalisation, but it is worthy of the notice of education authorities and their expert advisers. It is not a matter for investigation only by medical men. They are chiefly called upon to treat the deformity when it has come to a painful and gross form, and the clinical method of examination, with the foot raised, or even observation of the bare foot in standing, is not enough for the discovery of the slighter degrees of it. It needs to be observed from behind when the person is walking, so that the full degree of *working defect* may be known.

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